

10/536,990

Amendment Under 37 C.F.R. §1.111  
U.S. Appln No. 10/536,990

Atty. Docket: Q88113

phases, phase current command values  $I_{avref}$ ,  $I_{bvref}$ , and  $I_{cvref}$  are calculated according to a constant depending on the current command values  $I_{dref}$  and  $I_{qref}$  and a rotation angle  $\theta_e$  of the motor, whereby the object of the invention is attained.

56.  
10/4/09 Please replace paragraph 28 beginning on page <sup>13</sup>~~14~~ with the following amended paragraph:

The current control circuit includes integral control, the motor is a brushless DC motor, a current of the motor is a rectangular wave or a pseudo-rectangular wave, or the motor drive control device is used in an electric power steering device~~apparatus~~, whereby the object of the invention is attained more effectively.

Please replace paragraph 54 beginning on page 22 with the following amended paragraph:

In the invention, a motor drive control device shown in Fig. 8 is formed for the motor (with the number of poles P) having such characteristics. The motor drive control device of the invention includes a vector control phase current command value calculating unit 20, subtracting circuits 20-1, 20-2, and 20-3 that calculates respective phase current errors on the basis of phase current command values  $I_{avref}$ ,  $I_{bvref}$ , and  $I_{cvref}$  from the vector control phase current instruction value calculating unit 20 and motor phase currents  $I_a$ ,  $I_b$ , and  $I_c$  from current detecting circuits 32-1, 32-2, and 32-3, and a PI control unit 21 that performs proportional integral control. Respective phase command currents are supplied from an inverter 31 to the motor 1 according to PWM control of the PWM control unit 30 to control rotation drive for the motor 1. An area A indicated by a broken line forms a current control unit.

Please replace paragraph 55 beginning on page 22 and bridging page 23 with the following amended paragraph:

In this embodiment, in the vector control phase current command value calculating ~~circuit~~unit 20, current command values of vector control d and q components are determined using an excellent characteristic of vector control and, then, the current command values are converted into respective phase current command value. The vector control phase command

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10/9/07  
Please replace paragraph 72 beginning on page <sup>31</sup>32 with the following amended paragraph:

Conventionally, the two-phase/three-phase converting unit 109 in Fig. 1 calculates the phase current command values  $I_{avref}$ ,  $I_{bvref}$ , and  $I_{cvref}$  using the current command value  $I_{qref}$  and the advance angle  $\Phi$ . In the invention, as described above, the two-phase/three-phase converting unit 104 calculates the phase current command values  $I_{avref}$ ,  $I_{bvref}$ , and  $I_{cvref}$  with the current command values  $I_{dref}$  and  $I_{qref}$  as inputs. Then, the subtracting circuit 20-1, 20-2, and 20-3 subjects the respective phase currents  $I_a$ ,  $I_b$ , and  $I_c$  of the motor detected by the current detecting circuits 32-1, 32-2, and 32-3 and the phase current command values  $I_{avref}$ ,  $I_{bvref}$ , and  $I_{cvref}$  to calculate respective errors. Next, the PI control unit 21 controls the errors of the respective phase currents to calculate a command value for the inverter 31, that is, the voltage values  $v_a$ ,  $v_b$ , and  $v_c$  representing duty of the PWM control unit 30. The PWM control unit 30 subjects the inverter 31 to the PWM control on the basis of the voltage values  $v_a$ ,  $v_b$ , and  $v_c$ , whereby the motor 1 is driven and a desired torque is generated.

Please replace paragraph 80 beginning on page 35 with the following amended paragraph:

According to the invention, a motor terminal voltage is not saturated even at the time when a motor is rotating at high speed, torque ripple is reduced, and motor noise is reduced. Thus, if the invention is applied to an electric power steering ~~device~~apparatus, it is possible to provide an electric power steering ~~device~~apparatus that follows rapid steering of a wheel smoothly, does not cause a sense of incongruity in wheel operation, and has reduced noise.

Please replace paragraph 81 beginning on page 35 and bridging page 36 with the following amended paragraph:

According to the electric power steering ~~device~~apparatus in the invention, respective phase current instruction values are calculated on the basis of the vector control, and the PVC control for controlling respective phases separately is used as current feedback control. Thus, it is possible to provide a motor drive control device that can control the brushless DC motor to be